

CLAIMS

1. A motor drive control apparatus of a motor having three or more phases, comprising

    a motor position-estimating circuit for calculating rotation speed of the motor and rotor position of the motor,

    a vector control section for vector controlling based on rotation speed and the rotor position of the motor calculated by the motor position-estimating circuit,

    a rectangular wave control section for rectangular wave controlling the motor,

    a switch for switching between two control sections, and  
    a level detector having a set rotation speed N which is a determination reference of the switching of the switch,  
wherein

    the control is performed by switching the switch such that when the rotation speed of the motor calculated by the motor position-estimating circuit is faster than the set rotation speed N, the vector control section controls, and when the rotation speed is slower than the set rotation speed N, the rectangular wave control section controls.

2. The motor drive control apparatus according to claim 1, wherein the level detector comprises set rotation speeds N1 and N2 (wherein, N1>N2) having different set rotation speeds, the

motor drive control apparatus has such hysteresis characteristics that the rotation speed of the motor is slower than the set rotation speed N1 during rising process and is high speed, the switch is switched such that control is carried out by the vector control section from the rectangular wave control section, and when the rotation speed of the motor exceeds the set rotation speed N2 during the lowering process and is low speed, the switch is switched such that the control is carried out by the rectangular wave control section.

3. The motor drive control apparatus according to claim 1 or 2, wherein the motor position-estimating circuit comprises at least a hole sensor.
4. The motor drive control apparatus according to any one of claims 1 to 3, wherein the motor is a brushless DC motor.
5. The motor drive control apparatus according to any one of claims 1 to 4, wherein current of the motor is rectangular wave current.
6. An electric power steering apparatus using the motor drive control apparatus according to any one of claims 1 to 5.

7. A motor drive control apparatus comprising a d axis command current calculation section for calculating a d axis current command value  $I_{dref}$  for vector controlling the motor, a q axis command current calculation section for calculating a q axis current command value  $I_{qref}$ , and an angular speed detection circuit for detecting at least mechanical angular speed  $\omega_m$  of the motor, wherein when the mechanical angular speed  $\omega_m$  is faster than angular speed ( $\alpha \times \omega_b$ ) obtained by multiplying base angular speed  $\omega_b$  of the motor by  $\alpha$  ( $0 < \alpha < 1$ ), the d axis current command value  $I_{dref}$  is obtained from torque command value  $T_{ref}$  of the motor, the angular speed ( $\alpha \times \omega_b$ ) and the mechanical angular speed  $\omega_m$ .

8. The motor drive control apparatus according to claim 7, wherein when the angular speed detection circuit comprises a hole sensor as a constituent element, the motor drive control apparatus comprises an angular speed detection circuit for calculating mechanical angular speed  $\omega_m$  of the motor and a position of a rotor of the motor, a vector control section for vector controlling based on angular speed  $\omega_m$  of the motor and the rotor position calculated by the angular speed detection circuit, a rectangular wave control section for rectangular wave controlling the motor, a switch for switching the two control sections, and a level detector having set angular speed which becomes determination reference of the switching of the

switch, and

the control is performed by switching the switch such that when the mechanical angular speed  $\omega_m$  calculated by the angular speed detection circuit is faster than the set angular speed, the vector control section controls, and when the mechanical angular speed  $\omega_m$  is slower than the set angular speed, the rectangular wave control section controls.

9. The motor drive control apparatus according to claim 7 or 8, wherein the motor is a brushless DC motor having three or more phases.

10. The motor drive control apparatus according to claim 9, wherein current waveform or counter voltage waveform of the brushless DC motor is rectangular wave or pseudo rectangular wave.

11. An electric power steering apparatus using the motor drive control apparatus according to any one of claims 7 to 10.